CENTRAL RAILWAY

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MUMBAI - 400 001.

No.W.187.R.A./XII/Circular

Date: 16.04.2021

CAO/C

Sub: - Guiding limits of maximum cement content in concrete Mix Design for Railway structures and bridges.

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In connection with the above, may please find enclosed herewith a copy of **PCE vide Circular 208 of 2021 dated 05.04.2021** regarding "Guiding limits of maximum cement content in concrete Mix Design for Railway structures and bridges".

This is for kind information and necessary implementation in construction unit please.

DA/- PCE circular No. 208 of 2021.

(D.K. Mishra)
CE/SD

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Concrete mix design provides an optimal mix of ingredients to provide required workability during placement and also to give hardened concrete which serves dual purpose of required strength and durability. For various grade of concrete, IRS Concrete Bridge Code:2014 and IS 456:2000 prescribe minimum cement content and maximum water-cement ratio depending upon environmental exposure condition for Railway bridge works and other civil works respectively. Above codes also prescribe maximum cement content for concrete. Owing to different dynamic and static nature of loadings for Railway bridges and buildings, these codes prescribe different values of minimum & maximum cement contents.

In contracts, where item of concrete work is to be executed under USSOR, quantity of cement used in concrete is to be paid as an extra item as per Special Notes to Sr. No. 5 of Chapter 3 & 4 of USSOR-2011. Field Engineers are expected to perform due diligence in approval of concrete-mix design to achieve economy in cement content. Few instances have been reported where mix design have been finalized with higher w/c ratio and consequently higher cement content. On the contrary, in composite NS items of concrete, where cement is not to be paid separately, the cement content has been observed to be optimized to bare minimum.

Higher cement content, apart from being uneconomical, causes thermal shrinkage cracks and also adversely impacts environment. Instead of increasing w/c ratio, higher workability of concrete can be achieved by using suitable admixtures thereby keeping w/c ratio on lower side, so as to get concrete of adequate strength with reduced requirement of cement. Durable, impervious and high-performance concrete can be obtained through proper selection of ingredients, mix proportioning and using water reducing property of Super Plasticizers. USSOR items for RCC, provides for use of suitable admixture in mix-design.

In order to rationalize the cement in concrete mix design, based on the best construction practices adopted in the field, following guiding limits for Maximum cement content are hereby prescribed in concrete mixes of different grades, separately for Railway bridges and other structures:

Table 1

Guiding limits of Maximum Cement Content in Concrete Mix for works of ROB/RUB/FOB/Subways /Water ways Railway Bridges: -

Concrete Mix Grade	M 15	M 20	M25	M 30	M 35	M 40	M 45 & above
Maximum Cement Content (kg/cum)	315	350	380	410	440	475	500

Table 2

Guiding limits of Maximum Cement Content in Concrete Mix for works of Building/PF Shelter Foundation etc:-

Concrete Mix Grade	M 15	M 20	M25	M 30	M 35	M 40 & above
Maximum Cement Content (kg/cum)	300	330	360	390	420	450

Special Notes:

1. *Mix Design shall be got done either from the reputed Govt. Engineering Degree Colleges or from the NABL approved Engineering Test Laboratories as per IS: 10262 and it shall be critically checked w.r.t. provisions of CBC or IS:456 as applicable.*
2. *All concrete mix designs shall be approved at level of Engineer-in-charge i.e. sectional DEN/Sr DEN/Dy CE.*
3. *While designing the concrete mix, the environment to which concrete may be exposed during its working life shall be judiciously decided. Very severe and Extreme exposure conditions shall be used with caution. The level of severity shall not be unreasonably high e.g. for RUB may not warrant Very severe or Extreme exposure conditions. While approving mix design, Engineer-in-charge shall apply due diligence to this aspect.*
4. *Depending upon exposure conditions, minimum grade of concrete, minimum Cement content and max w/c ratio in the Mix Design shall be applicable as per CBC or IS:456 as applicable. A summary of the codal provisions is given in Annexure in Table 3 and Table 4 for ready reference.*